WE CLAIM:

1. An acoustic device, comprising:

a reservoir adapted to contain a fluid and having an exterior surface;

an acoustic radiation generator for generating acoustic radiation;

a means for delivering an acoustic coupling fluid to the exterior surface of the reservoir;

a means for positioning the acoustic radiation generator in acoustic coupling relationship via the acoustic coupling fluid to the reservoir such that acoustic radiation generated by the acoustic radiation generator is transmitted through the exterior surface and into any fluid contained in the reservoir; and

a means for eliminating uncontrolled flow of the acoustic coupling fluid at the exterior surface as a result of movement of the acoustic radiation generator.

2. The device of claim 1, comprising a plurality of reservoirs each adapted to contain a fluid and each having an exterior surface, wherein the means for positioning the acoustic radiation generator is adapted to position the acoustic radiation generator successively in acoustic coupling relationship to each of the reservoirs via the acoustic coupling fluid such that acoustic radiation generated by the acoustic radiation generator is transmitted through the exterior surfaces and into any fluid contained in the reservoirs.

3. The device of claim 2, wherein the reservoirs form a reservoir array.

4. The device of claim 3, wherein the reservoir array is a well plate and each reservoir is a well in the well plate.

5. The device of claim 4, wherein the exterior surface is substantially planar underside surface of the well plate.

6. The device of claim 2, wherein the means for positioning the acoustic radiation generator is adapted to position the acoustic radiation generator successively in acoustic coupling relationship to each of the reservoirs at a rate of at least about 1 reservoir per second.

7. The device of claim 6, wherein the means for positioning the acoustic radiation generator is adapted to position the acoustic radiation generator successively in acoustic coupling relationship to each of the reservoirs at a rate of at least about 10 reservoirs per second.

8. The device of claim 7, wherein the means for positioning the acoustic radiation generator is adapted to position the acoustic radiation generator successively in acoustic coupling relationship to each of the reservoirs at a rate of at least about 100 reservoirs per second.

9. The device of claim 1, comprised of an acoustic ejector that includes the acoustic radiation generator and a focusing means for focusing acoustic radiation generated by the acoustic radiation generator.

10. The device of claim 9, wherein the focusing means exhibits an F-number of at least about 1.

11. The device of claim 10, wherein the focusing means exhibits an F-number of at least about 2.

12. The device of claim 1, comprised of an a means for assessing the contents of the reservoir that includes the acoustic radiation generator and an analyzer for analyzing a characteristic of acoustic radiation generated by the generator and transmitted through the reservoir, wherein the analyzer is situated in radiation receiving relationship to the acoustic radiation generator.

13. The device of claim 1, wherein the means for delivering the acoustic coupling fluid is comprised of a source of the acoustic coupling fluid in fluid communication with a nozzle having an outlet that opens toward the exterior surface of the reservoir, and

further wherein the acoustic coupling fluid flows from the source to the outlet at a rate sufficient for the acoustic coupling fluid to establish conformal contact with the exterior surface of the reservoir.

14. The device of claim 13, wherein the acoustic coupling fluid is comprised of water.

15. The device of claim 1, wherein the acoustic coupling fluid exhibits an attenuation coefficient for acoustic radiation of a selected frequency that is no greater than the attenuation coefficient of water at the same frequency by more than about 10%.

16. The device of claim 13, further comprising a collector positioned in fluid-receiving relationship to the exterior surface of the reservoir so as to collect excess acoustic coupling fluid flowing therefrom.

17. The device of claim 16, wherein the nozzle is located within the collector.

18. The device of claim 13, wherein the acoustic radiation from the acoustic radiation generator is transmitted through the nozzle.

19. The device of claim 18, further comprising a means for positioning the nozzle relative to the exterior surface of the reservoir.

20. The device of claim 19, wherein the means for positioning the nozzle is capable of placing the nozzle no closer than a predetermined distance from the exterior surface of the reservoir.

21. The device of claim 20, wherein the means for positioning the acoustic radiation generator maintains the generator at a fixed distance from a free fluid surface within the reservoir while the generator is in acoustic coupling relationship to the reservoir.

22. The device of claim 19, wherein the nozzle and the acoustic radiation generator are movable along the same axis extending from the exterior surface of the reservoir.

23. The device of claim 22, wherein the axis is perpendicular to the exterior surface.

24. The device of claim 18, wherein the means for eliminating uncontrolled flow of the acoustic coupling fluid comprises a displacement member that maintains the acoustic coupling fluid at a constant volume within the nozzle in response any movement of the acoustic radiation generator within the nozzle.

25. The device of claim 24, wherein the displacement member is a piston.

26. The device of claim 24, wherein the displacement member is a diaphragm.

27. The device of claim 24, wherein the displacement member is at least partially located within the nozzle.

28. The device of claim 24, wherein the displacement member is at least partially located external to the nozzle in a chamber that fluidly communicates with the nozzle.

29. The device of claim 18, wherein the means for eliminating uncontrolled flow of the acoustic coupling fluid is comprised of a flow rate regulator that adjusts the flow rate of the acoustic coupling fluid from the source to the outlet according to movement of the acoustic radiation generator within the nozzle.

30. The device of claim 29, wherein the flow rate regulator is comprised of an adjustable valve located downstream from the source and upstream from the outlet.

31. The device of claim 1, wherein the means for delivering the acoustic coupling fluid is comprised of a container sealed against the reservoir and filled with the acoustic coupling fluid such that the acoustic coupling fluid is in conformal contact with the exterior surface of the reservoir, and further wherein the acoustic radiation generator is movable within the container.

32. The device of claim 31, wherein the acoustic coupling fluid is comprised of water.

33. The device of claim 31, wherein the acoustic coupling fluid exhibits an attenuation coefficient for acoustic radiation of a selected frequency that differs from the attenuation coefficient of water at the same frequency by no more than about 10%.

34. The device of claim 31, wherein the means for eliminating uncontrolled flow of the acoustic coupling fluid comprises a displacement member that maintains the acoustic coupling fluid at a constant volume within the container in response to movement of the acoustic radiation generator within the nozzle.

35. The device of claim 34, wherein the displacement member is a piston.

36. The device of claim 34, the displacement member is a diaphragm.

37. The device of claim 34, wherein the displacement member is at least partially located within the container.

38. The device of claim 34, wherein the displacement member is at least partially located external to the container in a chamber that fluidly communicates with the nozzle.

39. The device of claim 31, wherein the means for positioning the acoustic radiation generator has a structure does not substantially alter the volume of the acoustic coupling fluid within the container while positioning the acoustic radiation generator, and the structure serves as the means for eliminating uncontrolled flow of the acoustic coupling fluid.

40. A device for acoustically ejecting fluids from a plurality of reservoirs, comprising:

a plurality of reservoirs each adapted to contain a fluid and each having an exterior surface;

an ejector for ejecting droplets from the reservoirs, comprising an acoustic radiation generator for generating acoustic radiation and a focusing means for focusing the acoustic radiation generated;

a means for delivering an acoustic coupling fluid to the exterior surface of at least one of the reservoirs;

a means for positioning the ejector in acoustic coupling relationship via the acoustic coupling fluid to the at least one reservoir such that acoustic radiation generated by the acoustic radiation generator and focused by the focusing means is transmitted through the exterior surface and into any fluid contained in the at least one reservoir so as to eject a droplet therefrom; and

a means for eliminating uncontrolled flow of the acoustic coupling fluid at the exterior surface as a result of movement of the acoustic radiation generator.

41. The device of claim 40, wherein the means for positioning the ejector is constructed to position the ejector so as to establish acoustic coupling of the ejector to a plurality of reservoirs successively at a rate of at least 1 reservoir per second.

42. The device of claim 41, wherein the means for positioning the ejector is constructed to position the ejector so as to establish acoustic coupling of the ejector to a plurality of reservoirs successively at a rate of at least 10 reservoirs per second

43. The device of claim 42, wherein the means for positioning the ejector is constructed to position the ejector so as to establish acoustic coupling of the ejector to a plurality of reservoirs successively at a rate of at least 100 reservoirs per second.

44. The device of claim 40, wherein

the means for delivering the acoustic coupling fluid is comprised of a source of the acoustic coupling fluid in fluid communication with a nozzle having an outlet that opens toward the exterior surface of the reservoir, and

further wherein the acoustic coupling fluid flows from the source to the outlet at a rate sufficient for the acoustic coupling fluid to establish conformal contact with the exterior surface of the at least one reservoir.

45. The device of claim 44, further comprising a means for positioning the nozzle relative to the exterior surface of the reservoir.

46. The device of claim 45, wherein the means for positioning the nozzle and the means for positioning the ejector are synchronized to maintain flow of acoustic coupling fluid from the nozzle at a constant rate, thereby serving as the means for eliminating uncontrolled flow.

47. A method for transmitting acoustic radiation into a reservoir, comprising:

(a) delivering an acoustic coupling fluid to an exterior surface of a reservoir adapted to contain a fluid;

(b) positioning an acoustic radiation generator for generating acoustic radiation in acoustic coupling relationship via the acoustic coupling fluid to the reservoir; and

(c) activating the acoustic radiation generator so as to generate and transmit acoustic radiation through the exterior surface and into any fluid contained in the reservoir,

wherein steps (a) and (b) are carried out simultaneously in a manner that avoids uncontrolled flow of the acoustic coupling fluid at the exterior surface.

48. The method of claim 47, wherein steps (a) and (b) are repeated for an additional reservoir.

49. The method of claim 48, wherein steps (a) and (b) are repeated at a rate of at least 1 reservoir per second.

50. The method of claim 49, wherein steps (a) and (b) are repeated at a rate of at least 10 reservoirs per second.

51. The method of claim 50, wherein steps (a) and (b) are repeated at a rate of at least 100 reservoirs per second

52. The method of claim 47, wherein the acoustic radiation generated in step (c) is focused before transmitted through the exterior surface of the reservoir.

53. The method of claim 52, wherein the focused acoustic radiation ejects a droplet of fluid from the reservoir.

54. The method of claim 47, further comprising assessing the contents of the reservoir by analyzing a characteristic of acoustic radiation transmitted through the reservoir.

55. The method of claim 47, wherein step (a) is carried out by transporting the acoustic coupling fluid from a source of the acoustic coupling fluid through an outlet of a nozzle that opens toward the exterior surface of the reservoir at a flow rate sufficient for the acoustic coupling fluid to establish conformal contact with the exterior surface of the reservoir.

56. The method of claim 55, further comprising (d) collecting excess acoustic coupling fluid flowing from nozzle.

57. The method of claim 55, wherein the flow rate is substantially constant.

58. The method of claim 47, wherein step (a) is carried out by sealing a container containing the acoustic radiation generator and filled with the acoustic coupling fluid such that the acoustic coupling fluid is in conformal contact with the exterior surface of the reservoir.

59. A method for ejecting a droplet of fluid from each of a plurality of reservoirs, each containing a fluid, comprising:

(a) delivering an acoustic coupling fluid to an exterior surface of a reservoir adapted to contain a fluid;

(b) positioning an acoustic radiation generator for generating acoustic radiation in acoustic coupling relationship via the acoustic coupling fluid to the reservoir;

(c) activating the acoustic radiation generator to generate acoustic radiation;

(d) focusing and transmitting acoustic radiation through the exterior surface and into the reservoir so as to eject therefrom a droplet of fluid contained in the reservoir; and

(e) repeating steps (a) through (d) for at least one different reservoir,

wherein steps (a) and (b) are carried out simultaneously in a manner that avoids uncontrolled flow of the acoustic coupling fluid at the exterior surface.

60. The method of claim 59, wherein coupling fluid flow is delivered to the exterior surface at a constant flow rate during steps (b), (c), and (d).